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% Find approximation to the first derivatives of the functions  $f(x)=(x-1)^3$ 
% and  $g(x)=\sin(5x)(x-1)^3$  using the forward, backward and central
% differences.

clc;
clear all;

F_1 = @(x) sin(5*x).*power(x-1,2);
G_1 = @(x) power(x-1,3);
x=linspace(-1,1,200);
F=F_1(x);
G=G_1(x);

h=x(2)-x(1);
xCentral=x(2:end-1);
dFCentral=(F(3:end)-F(1:end-2))/(2*h);
dGCentral=(G(3:end)-G(1:end-2))/(2*h);
xForward=x(1:end-1);
dFForward=(F(2:end)-F(1:end-1))/h;
dGForward=(G(2:end)-G(1:end-1))/h;
xBackward=x(2:end);
dFBackward=(F(2:end)-F(1:end-1))/h;
dGBackward=(G(2:end)-G(1:end-1))/h;
hold on
plot(xCentral,dFCentral,'r')
plot(xForward,dFForward,'k');
plot(xBackward,dFBackward,'g');
plot(xCentral,dGCentral,'b')
plot(xForward,dGForward,'c');
plot(xBackward,dGBackward,'m');
legend('F-Central','F-Forward','F-Backward','G-Central','G-Forward','G-Backward')
```